ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

PALMPRINT AND FACE BASED MULTIMODAL RECOGNITION USING PSO DEPENDENT FEATURE LEVEL FUSION

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ABSTRACT

Biometrics refers to a scientific discipline which involves automatic methods for recognizing people based on their physiological or behavioural characteristics. Biometric systems that use a single trait are called unimodal systems, whereas those that integrate two or more traits are referred to as multimodal biometric systems. A multimodal biometric system requires an integration scheme to fuse the information obtained from the individual modalities. In this paper, we have designed and developed a technique for multi-modal biometric recognition using feature level fusion. Initially we consider two data sets namely face and palmprint. Using multi texton histogram we extract the features from the face and palmprints directly. We concatenate the face and palmprint using XOR, AND and OR gate with the help of Particle Swarm Optimization (PSO) algorithm. In recognition, the concatenated feature is matched through distance matching and distance score provides recognition identity of a person. The proposed technique is implemented with the help of evaluation metrics such as false acceptance rate, false rejection rate and accuracy. Finally the comparative analysis for the proposed fusion technique results 40% better accuracy, when compared with the existing techniques.

Keywords: *Biometrics, Face, Palmprint, PSO, Feature Extraction, Fusion*

1. INTRODUCTION

Biometrics is the process of identifying of an individual in terms of their physiological and behavioural characteristics [11]. Face, hand, eye, ear, skin, odor, dental and DNA are the general physiological characteristics which we have used. Voice, gait, keystroke, signature, mouse movement and pulse are the general behavioural characteristics which we have used; two or more biometrics can be merged to enhance the accuracy of recognition. Moreover, for identification some soft biometric traits such as gender, age, height, weight, ethnicity and eye colour can also be used. Usually through the live measurements of the characteristics of the human body, the biometric system is developed to solve the matching problem. It works in two stages. First a person should record his/her biometric in a system where the biometric templates are stored. Second the person should provide the same biometric for new measurements. The result of the new measurements will be processed using the same algorithm which is used at the time of registration and then contrasted to the stored template. If the similarity is larger than the system defined threshold, the verification is successful otherwise it would be unsuccessful.

Multimodal biometric system is one that combines the outcomes from two or more biometric traits to recognize an individual [9]. Compared to the unimodal system, multimodal system has more advantages. Merging the outcomes procured from diverse biometric traits by an effective fusion scheme would significantly improve the accuracy of the biometric system. Using the multimodal biometric system, the issues in the unimodal biometric system can be minimized. As it is tough to spoof multiple traits simultaneously, the multimodal system would resist spoofing. In multimodal biometric system, at all four levels of biometric system data fusion is possible. Sensor level, feature level, decision level and match score level are the four levels of fusions in biometric systems. In multimodal biometric system, each individual goes through all the biometric traits and the matching score procured by each trait are

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

merged by fusion strategy during the process of recognition. The performance of the recognition is based on the resultant score.

Face is one of the most popular biometric characteristics, due to the fact that it is the easiest biometric characteristic to acquire non-intrusively, in various modalities. The drawback of biometric systems based on face is that, compared to other biometric characteristics, due to many variations in face appearance, accuracy achieved using face as a biometric characteristic is generally low. Variations in face appearance are the effect of multiple factors such as face position, expression and aging. In addition, human hand contains a variety of features that can be used in biometrics and is considered to be one of the most acceptable biometric characteristics [21]. The drawback of biometric systems based on hand is the requirement of most systems for the user to place a hand on the sensor for identification or verification. The palm is the inner surface of the hand between the wrist and fingers,. Early works in automatic palmprint recognition utilized palmprint images obtained off-line [15, 19, 3, 18], while the newer systems typically obtain palmprint image by using a scanner [5] or a CCD camera [20,2]. In general, approaches for palmprint recognition can be divided into feature-based and appearance-based approaches. Feature-based approaches locate points of interest on the palm image or use other methods to locate and extract local features, where appearance-based approaches observe the entire palm image (previously normalized) as a feature vector.

In multi biometric fusion [14], feature level fusion [8], [13] makes use of integrated feature sets obtained from multiple biometric traits,. Fusion at feature level [8], [13] is found to be helpful than other levels of fusion such as match score fusion [22], decision fusion [22], rank level fusion [22]. Fusion at feature level is expected to provide more accurate authentication results since feature set contains relevant and richer information about the captured biometric evidence. As the feature sets are sometimes found to be incompatible, it is very hard to fuse multiple biometric evidences [8], [18] at feature extraction level in practice. Apart from this reason, there are two more reasons to attain fusion at feature extraction level such as the feature spaces are unknown for different biometric evidences and fusion of feature spaces may lead to the crisis of curse of dimensionality [8].

Initially, the features from two different modalities such as palmprint and face will be taken. Here, palm lines from palmprint are extracted directly and texture features from face are extracted through multi-texton histogram technique. Then, the extracted features from both the modalities are effectively combined with feature level fusion technique where, concatenation will be used. Here, the effective concatenation operator (XOR, AND, OR, Sum, PRODUCT) will be identified using Particle Swarm Optimization (PSO) algorithm. In recognition, the concatenated feature will be matched through distance matching and distance score provides recognition identity of a person.

The rest of the paper is organized as follows: A brief account on the contribution of this research is presented in section 2. The description about the review of related work is presented in Section 3. A brief account of the proposed methodology is given in section 4. The detailed experimental results and deliberations are given in Section 5. The conclusions are summed up in Section 6.

2. MAJOR CONTRIBUTIONS

The major contributions of this research work include:

- ***Extraction of palmprint and face Features:*** Extraction of features is done directly from palmprint and the extraction of the features from the face is done by multi-texton histogram technique.
- ***Fusion using PSO*:** Concatenation of palmprint and face is done by using OR, XOR and AND gates with the help of PSO algorithm.

3. REVIEW OF RELATED WORKS

For multi-modal biometric recognition, literature presents several techniques. With the help of feature level fusion, we hear reviewed some of the techniques based on face and palm print. Gayatri Umakant Bokade and Ashok.M. Sapkal [11] have proposed a feature Level Fusion of Palm and Face for Secure Recognition. Using two traits i.e., face and palmprint at feature extraction level, they presented an authentication for multimodal biometric system identification. The training database consists of face and palmprint images. They have used the Principal Component Analysis (PCA) method to extract the features from face and palmprints separately. The feature normalization and feature concatenation scheme followed by a dimensionality reduction procedure is adopted to form the feature matrix. To another fused match score, the normalized match (distance) scores generated by respective palm and face features

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

before fusion are used. The Euclidean distance and the feature distance are calculated after fusion. All three distances are used to arrive at final decision. in multimodal matching performance, Feedback routine implemented between the feature extraction and the matching modules of the biometric system can lead to substantial improvement.

Ivan Fratric [6] has proposed techniques and recent directions in palmprint and face Recognition. With the highest user-acceptance Face and palmprint are two biometric characteristics. They presented the techniques used in palmprint and face recognition as well as techniques used in biometric fusion. Face recognition in video and touchless hand biometrics are some of the recent research trends directions in palmprint and face recognitions. Slobodan Ribaric et al. [16] have proposed a bimodal biometric verification system for physical access control based on the features of the palmprint and the face. Based on palmprint or facial features by integrating them using fusion at the matching-score level, the system tries to improve the verification results of unimodal biometric systems. The verification process consists of image acquisition using a scanner and a camera, palmprint recognition based on the principal lines, face recognition with eigenfaces, fusion of the unimodal results at the matching-score level, and finally, a decision based on thresholding.

Nageshkumar.M *et al*. [10] have proposed an efficient secure multimodal biometric fusion using palmprint and face image. For automatically recognizing, with a high confidence a person's identity, Biometrics based personal identification is regarded as an effective method. Based on a single biometric modality, a multimodal biometric systems consolidate the evidence presented by multiple biometric sources and typically better recognition performance compare to unimodal system. Using two traits i.e. face and palmprint, they presented an authentication method for multimodal biometric system identification. Their system is designed for application where the training data contains a face and palmprint. Integrating the palmprint and face features increases robustness of the person authentication. The final decision is made by fusion at match score level in which features vectors are created independently for query measures and are then compared to the enrolment template, which are stored during database preparation. Multimodal biometric system is developed through fusion the of face and palmprint recognition.

Jian Yang *et al.* [7] have developed an Unsupervised Discriminant Projection (UDP) technique for dimensionality reduction of high dimensional data in small sample size cases. UDP can be seen as a linear approximation of a multimanifolds-based learning framework which takes into account both the local and nonlocal quantities. Seeking to find a projection that simultaneously maximizes the nonlocal scatter and minimizes the local scatter, UDP characterizes the local scatter as well as the nonlocal scatter. The characteristic makes UDP more intuitive and more powerful than the most up-to-date methods, for clustering or classification tasks, Locality Preserving Projection (LPP), which considers only the local scatter. Their method is applied to face and palm biometrics and is examined using the Yale, FERET, and AR face image databases and the PolyU palmprint database. The experimental results show that when the training sample size per class is small, UDP consistently outperforms LPP and PCA and outperforms LDA. This demonstrates that UDP is a good choice for real-world biometrics applications.

Asmita S.Deshpande *et al.* [1] have proposed a Multimodal Biometric Recognition System based on Fusion of Palmprint, Fingerprint and Face. To overcome limitations such as non-universality, noisy sensor data and susceptibility, multibiometric recognition systems, which aggregate information from multiple biometric sources, are gaining popularity. To spoofing over the single biometric systems, multibiometric systems promise significant improvements as higher accuracy and increased resistance. They presented a method which integrates fingerprint, palmprint and face and performs the fusion at score level. At the time of enrolment, three biometric traits are collected and stored in database. In the authentication stage query images will be compared against the stored templates and match score is generated. For fingerprint matching, AOV based minutiae algorithm is proposed. PCA analysis is used to compare the face images. Using PCA analysis, Palmprint matching score can be generated. To the fusion stage, This matching score will be passed. Fusion stage includes normalization of the scores. According to the biometric traits, weights can be assigned. To generate a total score, these weighted and normalized scores will be combined. In the decision stage, with certain threshold value total score will be compared. That will realize person's authenticity whether a person is genuine or imposter.

Yong-Fang Yao *et al*. [17] have proposed a face and palmprint feature level fusion for single sample

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

biometrics recognition. The biometric data usually shows three characteristics, In the application of biometrics authentication technologies,: large numbers of individuals, small sample size and high dimensionality. Single sample biometrics recognition problem is one of major research difficulties. It may lead to fair recognition result. To solve this problem, based on feature level biometrics fusion they presented an approach. He combine two kinds of biometrics: one is the facial feature which is a representative of contactless biometrics, and another is the palmprint feature which is a typical contact biometrics. Using Gabor-based image pre-processing and Principal component Analysis (PCA) techniques, he extract the discriminant feature. and then design a distance based separability weighting strategy to conduct feature level fusion. Using a large face database and a large palmprint database as the test data, their experimental results show that the presented approach significantly improves the recognition effect of single sample biometrics problem, and there is a strong supplement between face and palmprint biometrics.

R. Raghavendra *et al*. [11] have designed an efficient fusion schemes for multimodal biometric systems using face and palmprint. They addressed the problem of designing efficient fusion schemes of complementary biometric modalities such as face and palmprint, which are effectively coded using Log-Gabor transformations, resulting in high dimensional feature spaces. They proposed different fusion schemes at match score level and feature level, which they compared on a database of 250 virtual people built from the face FRGC and the palmprint PolyU databases. Moreover, they implemented a Particle Swarm Optimization (PSO) procedure which allows the number of features (identifying a dominant subspace of the large dimension feature space) to be significantly reduced while keeping the same level of performance in order to reduce the complexity of the fusion scheme. Results in both closed identification and verification rates show a significant improvement of 6% in performance when performing feature fusion in Log-Gabor space over the more common optimized match score level fusion method.

Asmita S.Deshpande *et al*. [1] have proposed a Multimodal Biometric Recognition System based on fusion of palmprint, fingerprint and face. To overcome limitations such as non-universality, noisy sensor data and susceptibility Multibiometric recognition systems, which aggregate information from multiple biometric sources, are gaining popularity. Yong-Fang Yao *et al.* [17] have proposed a Face and palmprint feature level fusion for single sample biometrics recognition. The biometric data usually shows three characteristics, In the application of biometrics authentication technologies, large numbers of individuals, small sample size and high dimensionality.R. Raghavendra *et al.* [11] have designed an efficient fusion schemes for multimodal biometric systems using face and palmprint. They addressed the problem of designing efficient fusion schemes of complementary biometric modalities such as face and palmprint, which are effectively coded using Log-Gabor transformations, resulting in high dimensional feature spaces. R. Raghavendra *et al.* [11] have designed an efficient fusion schemes for multimodal biometric systems using face and palmprint. They addressed the problem of designing efficient fusion schemes of complementary biometric modalities such as face and palmprint, which are effectively coded using Log-Gabor transformations, resulting in high dimensional feature spaces.

4. PROPOSED METHODOLOGY FOR FACE AND PALMPRINT RECOGNITION

Palmprint and facial feature extraction are becoming one of the major issues in finding the identity of a person. Quite a lot of techniques have been available for the extraction of face and palm print. In this paper, we have developed an efficient technique for the extraction of face and palmprint. The proposed system is shown in figure1

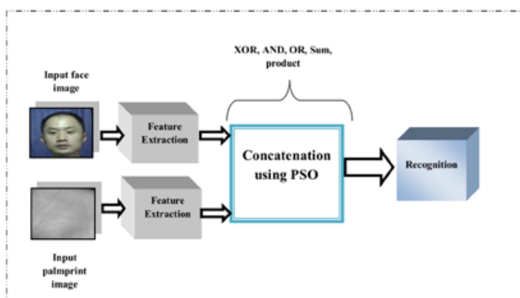

Figure.1. Proposed System

Face and palmprint images are given as inputs from which the input features are extracted and fused using XOR, OR, AND, Sum, Product with the help of PSO algorithm. By using distance matching the concatenated feature is matched and the distance score will provide recognition identity of a person.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

4.1 Palmprint Feature Extraction

In this section, we have described about the palmprint feature extraction technique. Here, palm print features are extracted based on the x and y co-ordinates. The detailed palm print feature extraction steps are shown in figure 2.

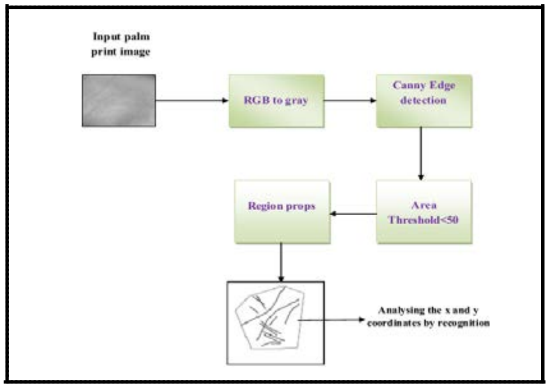

Figure.2. Palmprint Feature Extraction

There are various steps in palmprint extraction are as follows:

(i) Initializing the input

Initially, the input palm print image is taken for which the feature extraction has to be done.

(ii) Applying RGB to Gray scale component

Palmprint images cannot be given directly as the input for the proposed technique. Here, input palm print images are firstly converted into RGB colour space in order to get the extracted features. It converts RGB images to gray scale by eliminating the hue and saturation information while retaining the luminance.

(iii) Canny Edge detection method

Subsequently, the edge detection method i.e. canny edge detection method is applied which extracts the edges. The probability of detecting real edge points should be maximized while the probability of falsely detecting non-edge points should be minimized. The detected edges should be as close as possible to the real edges.

(iv) Region Cropping

Consequently, the region Crops method is applied on the edge extracted image. The main function of region props is measured the properties of image regions and this region props method calculates the centroid of each region with the decimal places.

(v)Setting the threshold

The threshold value is set as 50.Therefore the line having pixels area greater than 50 are extracted from the image. The line having the pixels area which is less than 50 are eliminated in the croped image.

(vi) Analyzing the x and y coordinates

Finally, x and y coordinates are determined for the image segment. Then the length of the x and y coordinates gives the feature extracted palm print image.

4.2 Facial Feature Extraction Using Multi-Texton Histogram (MTH)

The following section describes about the multi-texton histogram used in face image extraction, the various steps in multi texton histogram are as follows:

- For initializing the input image, the input face image is taken first, for which the feature has to be done. Here we apply multi-histogram technique for the extraction of the image.
- We divide the input image into a number of blocks and we find the pixel value in each block in the input image.
- Gradient method is applied to the input image such that features are extracted .
- For fixing the counter value, 0-255 is taken as the counter value, the counter value is set according to the pixel value.
- For analyzing the counter value ,0-255 count is noted in each block in the input image and also in the gradient applied image i.e. how many times 0-255 value is present in the block is noted
- For the feature extraction, 0-20 features are blocked as the separate counter value and nearly 12 features are obtained from the input image and from the gradient applied image.

With two neighbouring pixels whose distance is D, we define the MTH as follows:

$$H(T(p_1)) = \begin{cases} N\{\theta(p_1) = V_1 \wedge \theta(p_2) = V_2 \| p_1 - p_2 \| = D\} \\ where \quad \theta(p_1) = \theta(p_2) = V_1 = V_2 \end{cases} \quad (1)$$

$$H(\theta(p_1)) = \begin{cases} Z\{T(p_1) = W_1 \wedge T(p_2) = W_2 \| p_1 - p_2 \| = D\} \\ where \quad T(p_1) = t(p_2) = W_1 = W_2 \end{cases} \quad (2)$$

where,

The values of a texton image T are denoted as w Є{0,1...W-1}, P_1={X_1,Y_1} and P_2={X_2,Y_2} denotes the two neighbouring pixels, and their values are $T(P_1)=W_1$ and $T(P_1)=W_1$.

Journal of Theoretical and Applied Information Technology
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ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

In the texture orientation image θ(x,y) the angles at P_1 and P_2 are denoted by $\theta(P_1)=V_1$ and $\theta(P_2)=V_2$. In texton image T, two different texture orientations may have the same color, while in texture orientation image $\theta(X,Y)$ two different colors may have the same texture orientation. Denote by N the co-occurring number of two values V_1 and , V_2 and by Z the co-occurring number of two values W_1 and W_2

4.3 Concatenation Using Particle Swarm Optimization

In the following section, we describe the process of concatenation of facial and palmprint using PSO. In this technique we use formulation for the concatenation of the facial and palmprint images. Formulations are given as the input for the PSO, it checks which operator is present in the equation and it replaces the operator with higher priority. The formulation which gives the higher accuracy is obtained as the output.

The various fusion formulations used in the PSO are as follows:

$$\left\{\begin{array}{l}(A+B),(A-B),(A*B),(A/B),(A/B),(A+B)+\\(A-B),(A+B)-(A-B),(A+B)*(A-B),\\(A+B)/(A-B),(A+B)+(B-A),2*(A+B),\\(A+B)-(B-A),(A+B)+A,(A+B)-B,(A+B)*B,\\(A+B)/A,(A+B)+B,(A+B)-B,(A-B)+A\end{array}\right\} \quad (3)$$

where, A-denotes the face features
B-denotes the palm print features

From those fusion formulas, we have obtained the best formula for fusion technique using PSO. In addition, PSO maintains the global best value, which is the best objective value any particle has ever experienced, and the global best position, that is the position at which the global best value has been found.

The various steps involved in Particle Swarm Optimization algorithm are as follows:

Step 1: Initially it checks which operator is present in the equation.
Step 2: At each iteration, the priority of the particles are updated according to

$$v_i = v_i + c_r r_1(p_{i,best} - p_i) + c_2 r_2(g_{i,best} - p_i) \quad (4)$$

where P_i and v_i are the position and velocity of particle i, respectively

$P_{i,best}$ and $g_{i,best}$ is the position with the 'best' objective value found so far by particle i and the entire population respectively.

w is a parameter controlling the dynamics of flying;

r_1 and r_2 are random variables, c_1 and c_2 are factors controlling the related weighting of the corresponding terms. The random variables help the PSO with the ability of stochastic searching.

For the calculation of fitness

$$\text{Fitness}=1-\left[\frac{FAR+FRR}{2}\right] \quad (5)$$

where,

$$\text{FAR} = \frac{No\ \ of\ \ false\ \ accep\tan ce}{No\ \ of\ \ total\ imposter\ \ attempts} \quad (6)$$

$$\text{FRR} = \frac{No\ \ of\ \ false\ \ rejec\tan ce}{No\ \ of\ \ total\ authentic\ \ attempts} \quad (7)$$

Step 3: **Position updating**: The positions of all particles are updated according to,

$$p_i = p_i + v_i \quad (8)$$

After updating, r_1 should be checked and limited to the allowed range.

Step 4: Memory updating-Update $P_{i,best}$ and $g_{i,best}$ when condition is met,

$$p_{i,best} = p_i \quad if \quad f(p_i) > f(p_{i,best}) \quad (9)$$

$$g_{i,best} = g_i \quad if \quad f(g_i) > f(g_{i,best}) \quad (10)$$

Where f(x) is the objective function to be optimized.

Step 5: Stopping the condition -The algorithm repeats 2 to 4 until certain stopping conditions are met, such as a pre-defined number of iterations. Once stopped, the algorithm reports $P_{i,best}$ and $g_{i,best}$

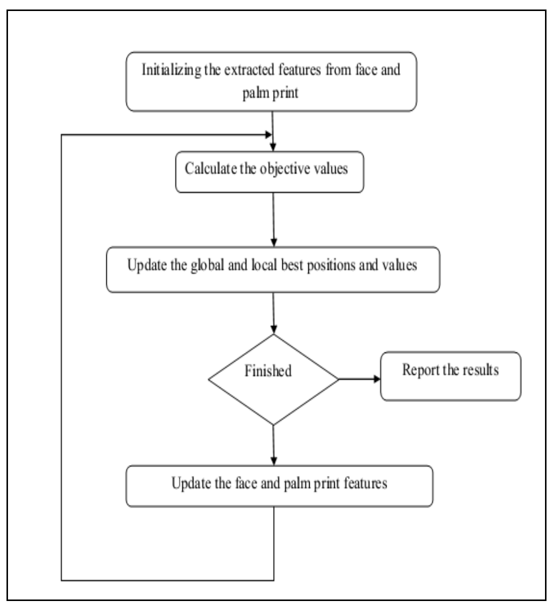


Figure. 3. Flow Chart Of PSO

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

4.4 Recognition of Facial and Palmprint

After the concatenation of the face and palm print images we go for the recognition process for image distance matching. In recognition, the concatenated feature is matched through distance matching and distance score provide recognition identity of a person. We have obtained the best formula for fusion technique using PSO having the higher accuracy and then matching is done by using Euclidean distance. The Euclidean distance is used for measure minimum distance

$$d(x_i, x_j) = \sqrt{\sum_{r=1}^{n} (a_r(x_i) - a_r(x_j))^2} \qquad (11)$$

5. RESULTS AND DISCUSSION

This section describes the experimental results of our proposed face and palmprint extraction technique. Our proposed approach is worked in MATLAB (matlab version 7.12).

5.1 Dataset

This section describes the experimentation of the proposed technique of the face and palmprint images taken from the CASIA database [23] .For training and testing of the facial and palmprint , we have taken 50 face images from 10 persons and an equal number of palm print images from them.

Figure. 4. Sample Face Images

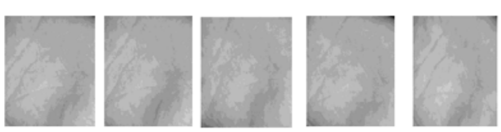


Figure. 5. Sample Palm Print Images

5.2 Evaluation Metrics

The proposed technique is implemented with the help of evaluation matrices such as accuracy, false acceptance rate and false rejection rate.

False Acceptance Rate (FAR): It is ratio of number of false acceptance and number of total imposter attempts. It is indirectly proportional to the number of total imposter attempts.

$$\text{FAR (\%)} = \frac{No \ \ of \ \ false \ \ acceptance}{No \ \ of \ \ total \ imposter \ \ attempts} \qquad (12)$$

False Rejection Rate (FRR): It is ratio of number of false rejection and number of total authentic attempts. It is indirectly proportional to the number of total authentic attempts.

$$\text{FRR (\%)} = \frac{No \ \ of \ \ false \ \ rejectance}{No \ \ of \ \ total \ authentic \ \ attempts} \qquad (13)$$

Accuracy: In order to find out which equation suits for fusion we calculate the accuracy. We use the following formula to calculate the accuracy

$$1 - \left[\frac{FAR + FRR}{2}\right] \qquad (14)$$

5.3 Experimental Results

In this section, we present the experimental set up for the facial and palmprint image extraction. We have taken 80% and for testing 20% from the given database. Figure 6 shows the various stages of palm print images and figure 7 shows the various stages of facial feature extraction.

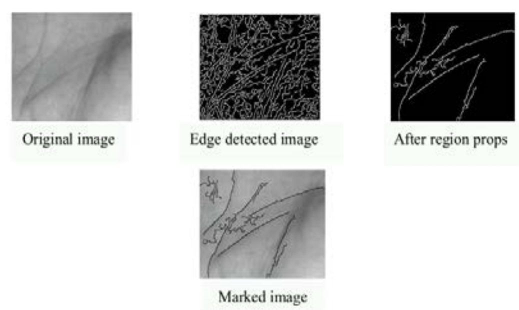
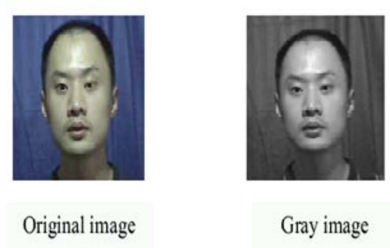


Figure. 6. Various Stages Of Palmprint Feature Extraction



Intensity value of Original image	Intensity value of Gradient image
[1,41063,64188,66854,39512,7245,2631,2432,2320,1544,601,273]	[0,0,81072,0,0,0,0,0,0,0,0,0]

After MTH

Figure. 7. Various Stages Of Facial Feature Extraction

Journal of Theoretical and Applied Information Technology
30th November 2013. Vol. 57 No.3

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

5.3.1 Fusion Procedure

For our proposed fusion technique, we have taken various fusion formulas. Finally, we obtain best fusion formula from the PSO. The resultant best fusion formulas are given by

- 2*(A+B) (15)
- (A-B) +A (16)

where, A- denotes the facial features
B-denotes the palmprint features

5.4 Performance Evaluation

Threshold vs FAR (proposed) for fusion formula 2*(A+B)

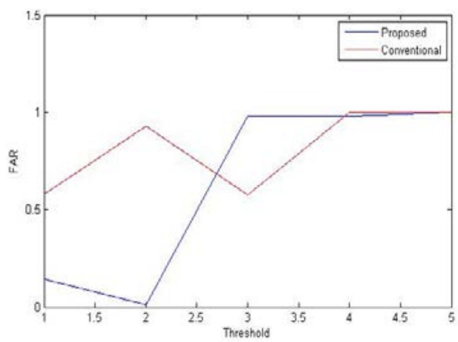


Figure. 8. Comparative Analysis Graph For FAR Vs. Threshold For The Proposed And The Conventional Methods.

The above figure 8 shows the Threshold vs. FAR analysis for the facial and palmprint extraction. It shows that in the proposed work the FAR range is found to be better when compared with the existing work. For the threshold value of 2, In our proposed work 0 is resulted as FAR value and in the existing work 0.82 is resulted as FAR value. As the threshold increases the FAR value also increases in the proposed method.

Threshold vs FRR (proposed) for fusion formula 2*(A+B)

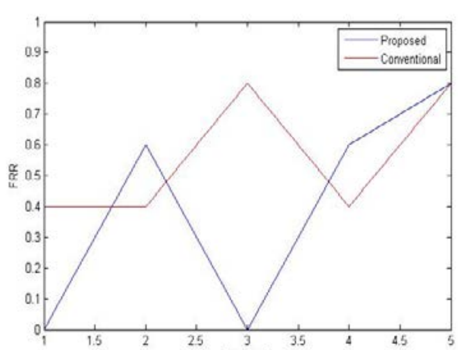


Figure. 9. Comparative Analysis Graph For FRR Vs. Threshold For The Proposed And The Conventional Methods.

The above figure 9 shows the Threshold vs. FRR analysis for the facial and palmprint extraction. It shows that in the proposed work the FRR range is found to be better when compared with the existing work. For the threshold value of 3, In our proposed work 0 is resulted as FRR value and in the existing work 0.81 is resulted as FRR value. As the threshold increases the FRR value also increases in the proposed method.

Threshold vs accuracy (proposed) for fusion formula 2*(A+B)

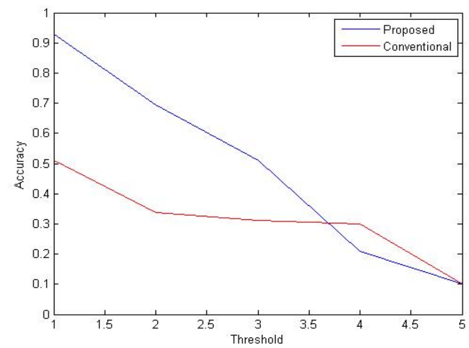


Figure. 10. Comparative Analysis Graph For Accuracy Vs. Threshold For The Proposed And The Conventional Methods.

The above figure 10 shows the Threshold vs. Accuracy analysis for the facial and palmprint extraction. It shows that in the proposed work the accuracy range is found to be better when compared with the existing work. For the threshold value of 0, In our proposed work 92% is resulted as accuarcy value and in the existing work 52% is resulted as accuracy value. As the threshold increases the accuracy value in the proposed method is decreased.

Threshold vs FAR (proposed) for fusion formula (A-B)+A

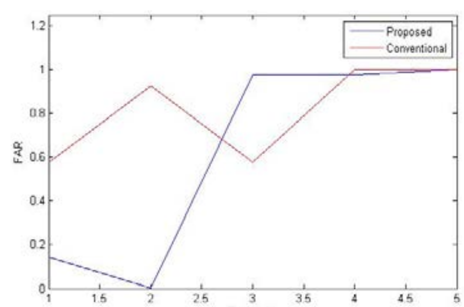


Figure. 11. Comparative Analysis Graph For FAR Vs. Threshold For The Proposed And The Conventional Methods.

Journal of Theoretical and Applied Information Technology
30th November 2013. Vol. 57 No.3

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

The above figure 11 shows the Threshold vs. FAR analysis for the facial and palmprint extraction. It shows that in the proposed work the FAR range is found to be better when compared with the existing work. . For the threshold value of 2, In our proposed work 0 is resulted as FAR value and in the existing work 0.92 is resulted as FAR value. As the threshold increases the FAR value also increases in the proposed method.

Threshold vs FRR (proposed) for fusion formula (A-B)+A

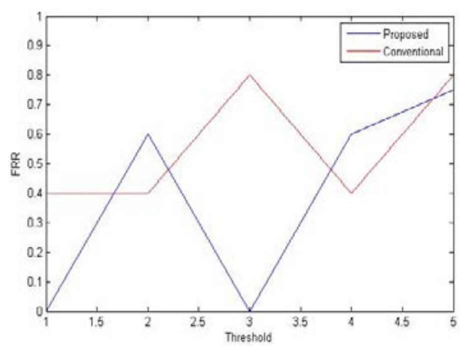


Figure. 12. Comparative Analysis Graph For FRR Vs. Threshold For The Proposed And The Conventional Methods.

The above figure 12 shows the Threshold vs. FRR analysis for the facial and palmprint extraction. It shows that in the proposed work the FRR range is found to be better when compared with the existing work. For the threshold value of 3, In our proposed work 0 is resulted as FRR value and in the existing work 0.81 is resulted as FRR value. As the threshold increases the FRR value also increases in the proposed method.

Threshold vs accuracy (proposed) for fusion formula (A-B)+A

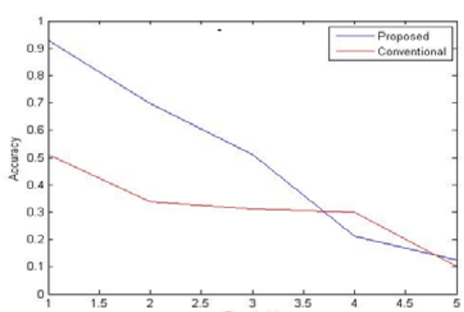


Figure. 13. Comparative Analysis Graph For Accuracy Vs. Threshold For The Proposed And The Conventional Methods.

The above figure 13 shows the Threshold vs. Accuracy analysis for the facial and palmprint extraction. It shows that in the proposed work the accuracy range is found to be better when compared with the existing work. For the threshold value of 0, In our proposed work 92% is resulted as accuracy value and in the existing work 52% is resulted as accuracy value. As the threshold increases the accuracy value in the proposed method is decreased.

6. CONCLUSION

In this paper, we have presented a technique for multi-modal biometric recognition using feature level fusion. Initially we take data sets namely face and palmprint. Using multi-texton histogram we extract the features from the face and the palm print features are extracted directly. We concatenate the face and palmprint using XOR, AND and OR gate with the help of Particle Swarm Optimization algorithm. In recognition, the concatenated feature is matched through distance matching and distance score is provides recognition identity of a person. The proposed technique is obtained with the help of evaluated with the performance metrics such as false acceptance rate, false rejection rate and accuracy. Finally, the comparative analysis shows the proposed fusion technique provides 92% accuracy for both the equation such as *(A-B)+A*, *2*(A+B)* .This provide better results when compared to texisting technique.

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